GIS APPLICATION FOR INVENTORY OF FLOODPRONE AREAS

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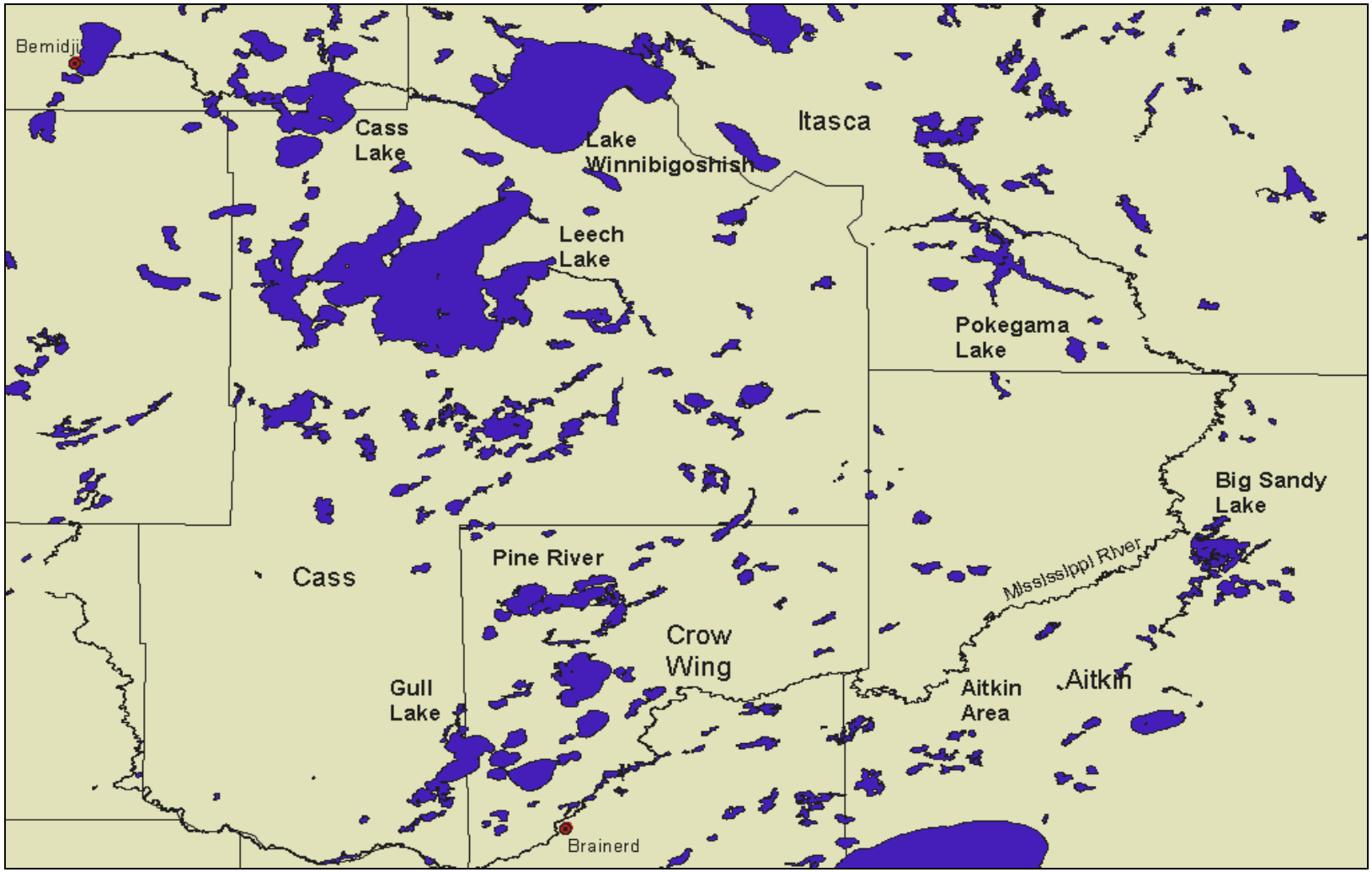
Introduction

- Data needs
- Methodologies for conducting structure inventories
- Specific info used for two projects
  - Roseau – urban area
  - Headwaters ROPE Study – reservoir rural area

Data Needs

- Had no good base data
- Options were to use topo's or LIDAR mapping
  - For sensitive evaluations, these were not accurate enough
- Could have collected the "normal" base data for economic analysis only
  - The value of the additional data is great, and useful for many other areas
  - The finished data set has real value to sponsor

Study Area


Bemidji
Cass Lake
Lake Winnibigoshish
Itasca
Leech Lake
Pokegama Lake
Big Sandy Lake
Mississippi River
Cass
Pine River
Crow Wing
Gull Lake
Aitkin Area
Aitkin
Brainerd

Methodology

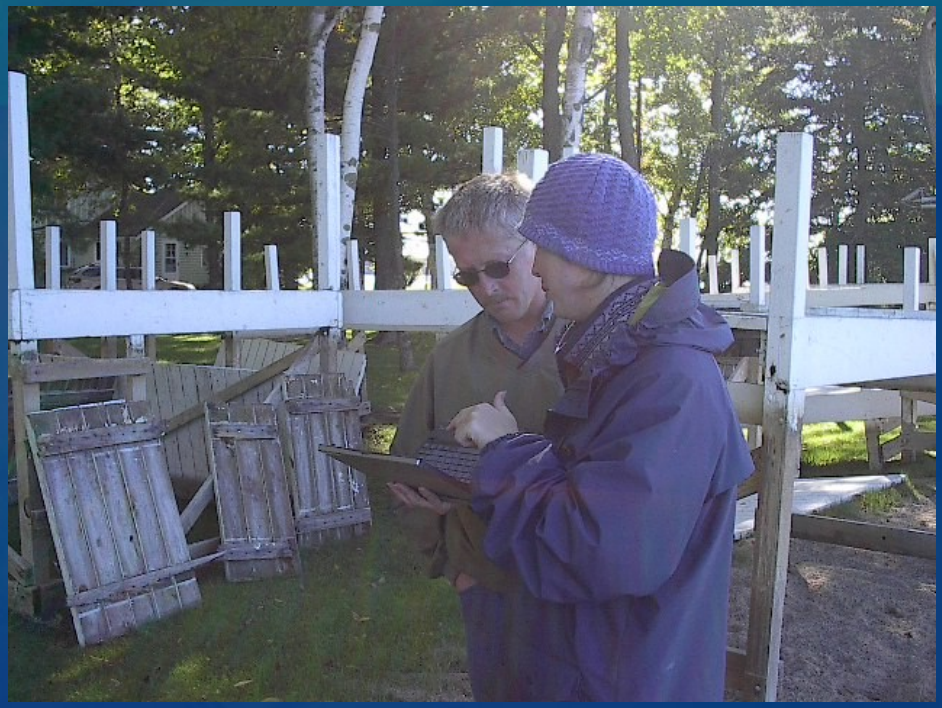
- Record data electronically while in field
  - Data entered directly into database (Access)
  - Custom data entry form for each project
  - No need to re-enter data back in office
  - Ability to control data entered
- Download data from crews into master database
  - Check quality of data daily
  - Re-collect missing data while in study area
- Integrate GIS
  - Quality check
  - Graphical Presentation

Structure Information

- **Address**
- **First floor elevation**
- **Lowest adjacent grade**
- **Effective age**
- **Construction quality**
- **Condition**
- **Photograph**
- **Size of habitable area**
- **Use of structure**
- **GPS coordinates**
- **Type of foundation**
- **Type of exterior wall**
- **Type of roofing**
- **Presence of outbuildings**
- **Presence of fireplaces**
- **Type of utilities**
- **Style of structure**

Field Equipment

- Handheld GPS units
- Digital cameras
- Hand levels
- Laptop computer
- Hand held computers or PDAs



Data Collection

Handheld Computer

- All information on one screen
- Portable
- Instant on

PDA

- Very compact/portable
- Attachable GPS units

Data Collection Format

- Database (Access)
- ArcPAD

Minnesota Structure Inventory

Structure ID 6

Denied Access ☐

Fire Identification #

Reporting Fire Station

Habitable Area 2100

Effective Age 10

Address

Street #	Street Name	Suffix
42296	EAGLE	ST

Lake Name AITKIN

Photograph ID IM000050

Elevation

First Floor 1203.86 **Lowest Adjacent** 1201.57

Coordinates

X -93.73399 **Y** 46.54281

Quality of Construction GOOD

Condition AVERAGE

Style ONE-STORY

Exterior Wall SIDING

Roofing COMPOSITION SHINGLE

Miscellaneous Items

- ☑ Attached Garage
- ☐ Carport
- ☑ Detached Garage
- ☐ Fireplace
- ☑ Shed
- ☐ Boat House
- ☐ Barns

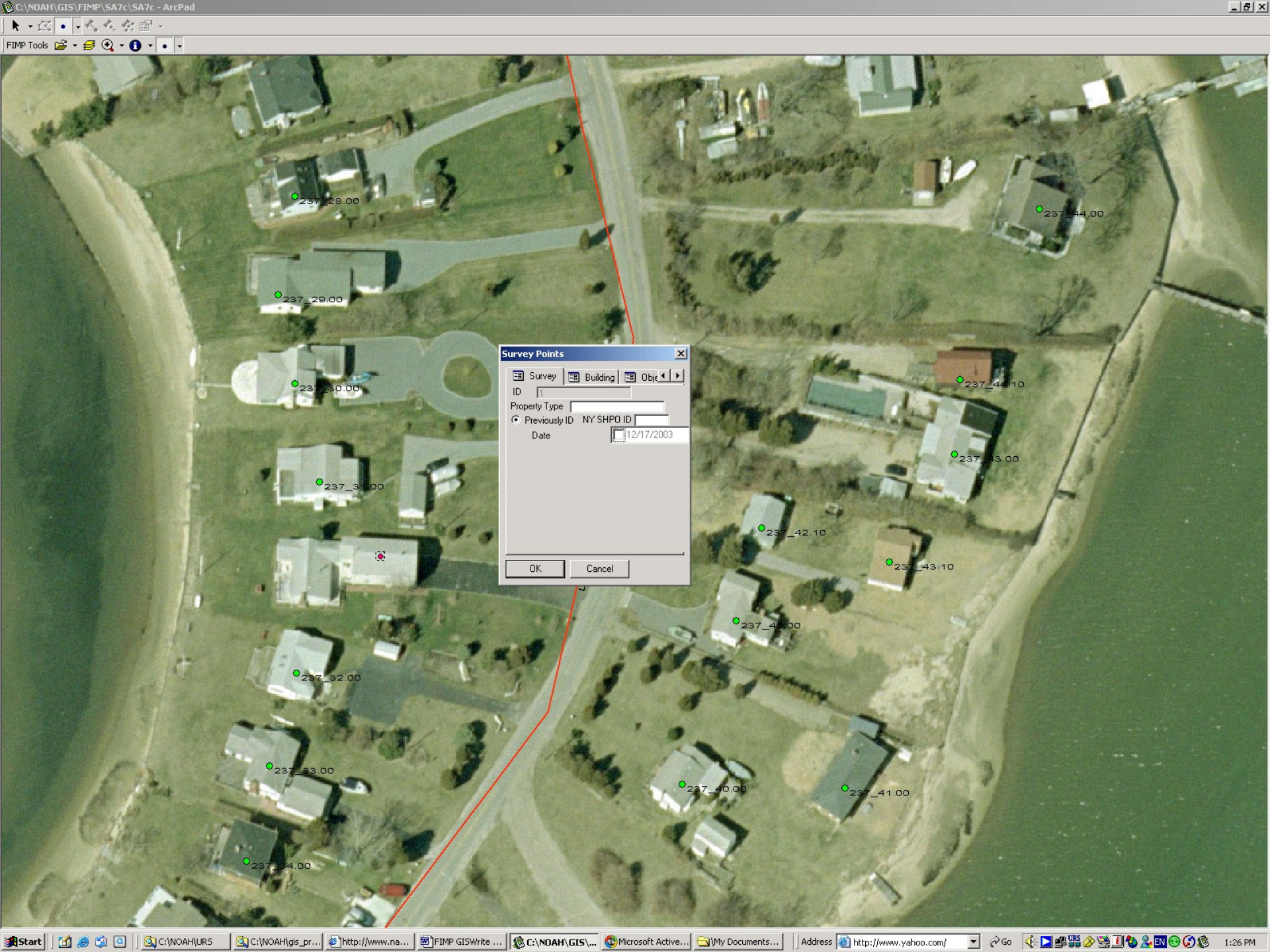
Type of Structure SINGLE FAMILY

Type of Foundation CRAWL SPACE

Use of Structure RESIDENTIAL

Type of Utilities SEPTIC SYSTEM

Comments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FIMP Tools
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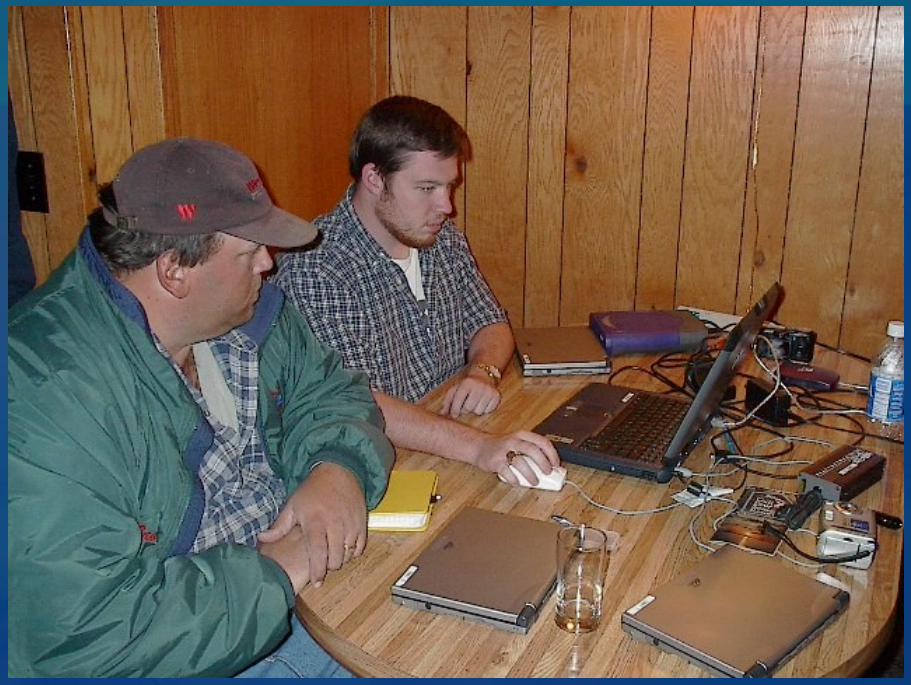
Survey Points
Survey
Building
ID
Property Type
Previously ID
NY SHPO ID
Date
12/17/2003
OK
Cancel
Start
1:26 PM

QA/QC

- Download data nightly
- Check database for missing information
- Check GPS coordinates for outliers
- Check elevation data for outliers
- Correct/insert address information
- Verify structural characteristics from photographs
- Run statistical comparisons between surveyors



HEADWATERS ROPE STUDY: STRUCTURE INVENTORY

STRUCTURE NUMBER 10

STRUCTURE TAG 1-09052001-2

DATE 9/5/2001

DENIED ACCESS ☐

FIRE ID 23A9

FIRE STATION AITKIN

ADDRESS 36384 416TH PL

ZIP CODE 56431

AREA AITKIN

COORDINATES

NORTHING 46.53876

EASTING -93.72127

ELEVATION

FIRST FLOOR 1204.71 FT

LOWEST ADJACENT GRADE 1201.86 FT

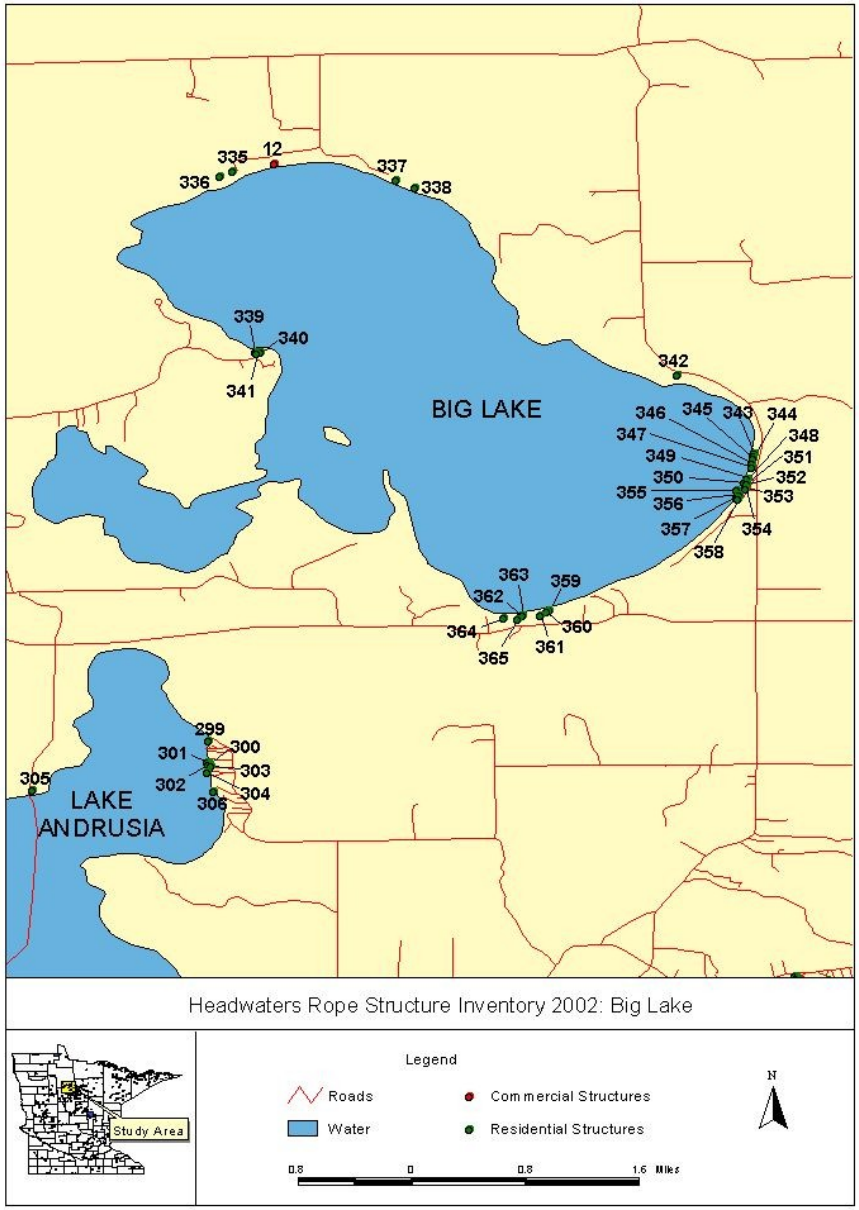
PHOTOGRAPH OF STRUCTURE

COMMENTS

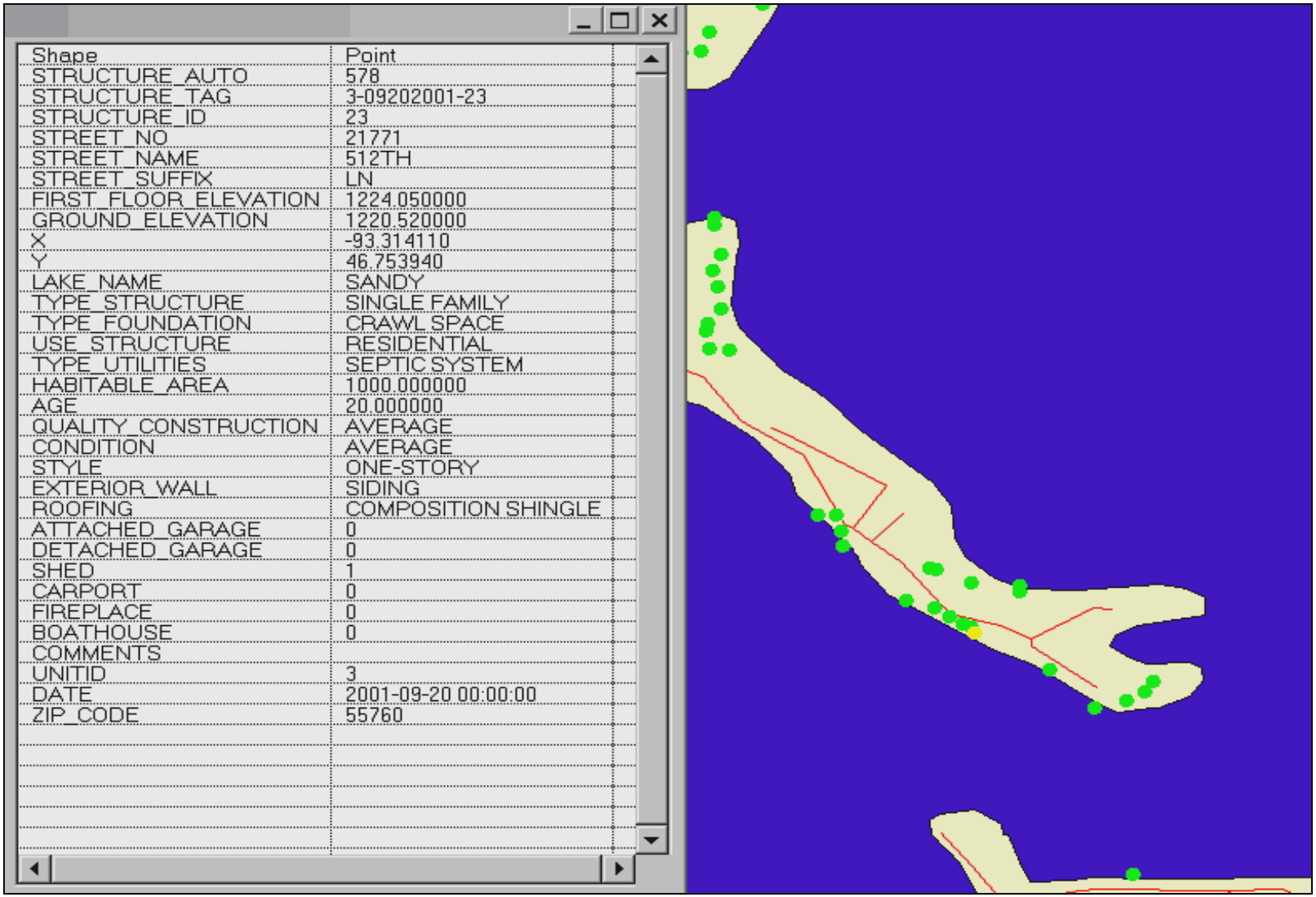
STRUCTURE CHARACTERISTICS

TYPE OF STRUCTURE	SINGLE FAMILY	EXTERIOR WALL	SIDING
TYPE OF FOUNDATION	BASEMENT	ROOFING	COMPOSITION SHINGLE
USE OF STRUCTURE	RESIDENTIAL	ATTACHED GARAGE	☐
TYPE OF UTILITIES	MOUND SYSTEM	DETACHED GARAGE	☑
HABITABLE AREA	2000	SHED	☑
EFFECTIVE AGE	15	CARPORT	☐
QUALITY OF CONSTRUCTION	AVERAGE	FIREPLACE	☑
		BOATHOUSE	☐
CONDITION	AVERAGE	BARN	☑
STYLE	TWO-STORY		

Example of Results Map

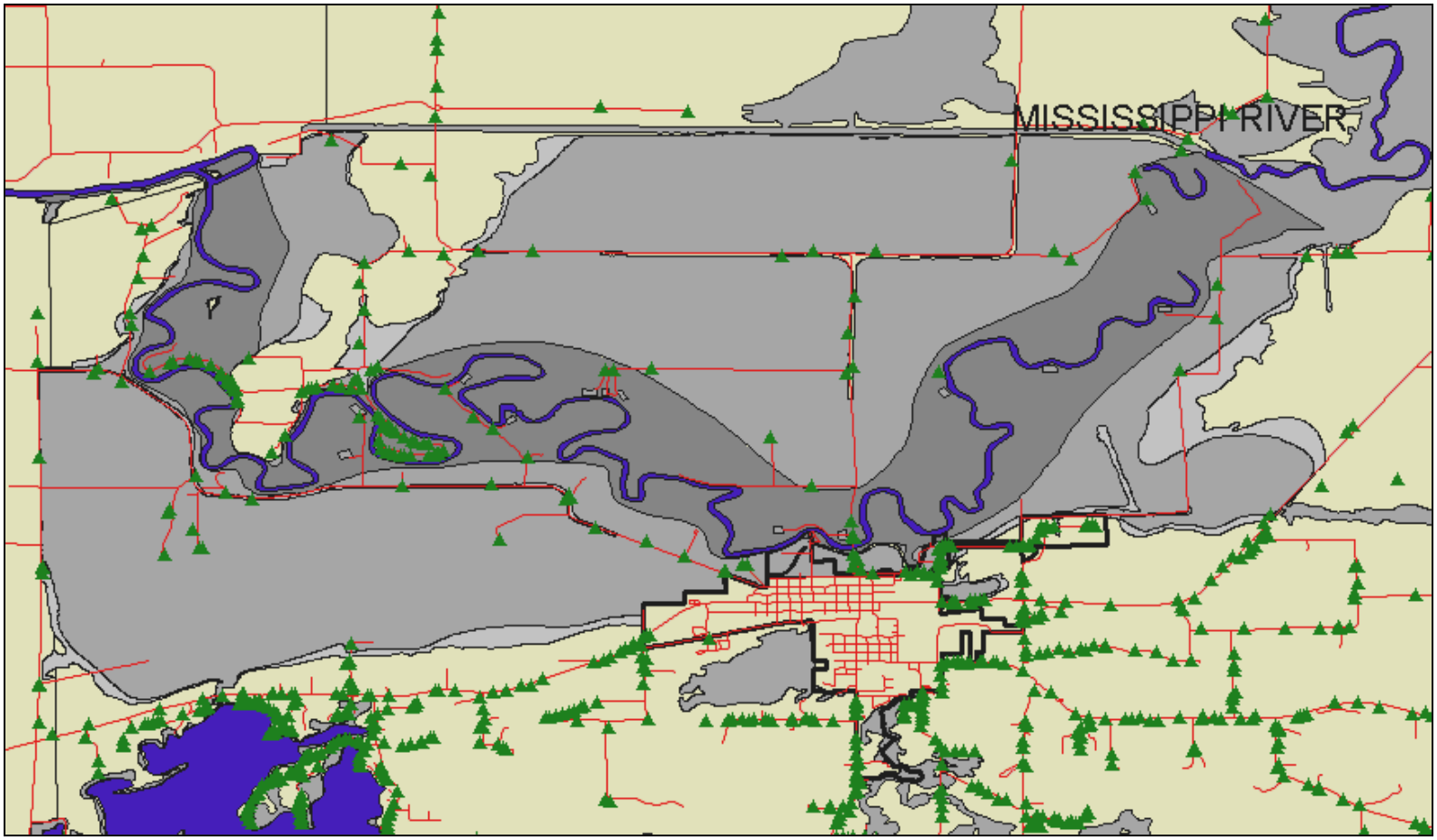


Obtaining information from GIS

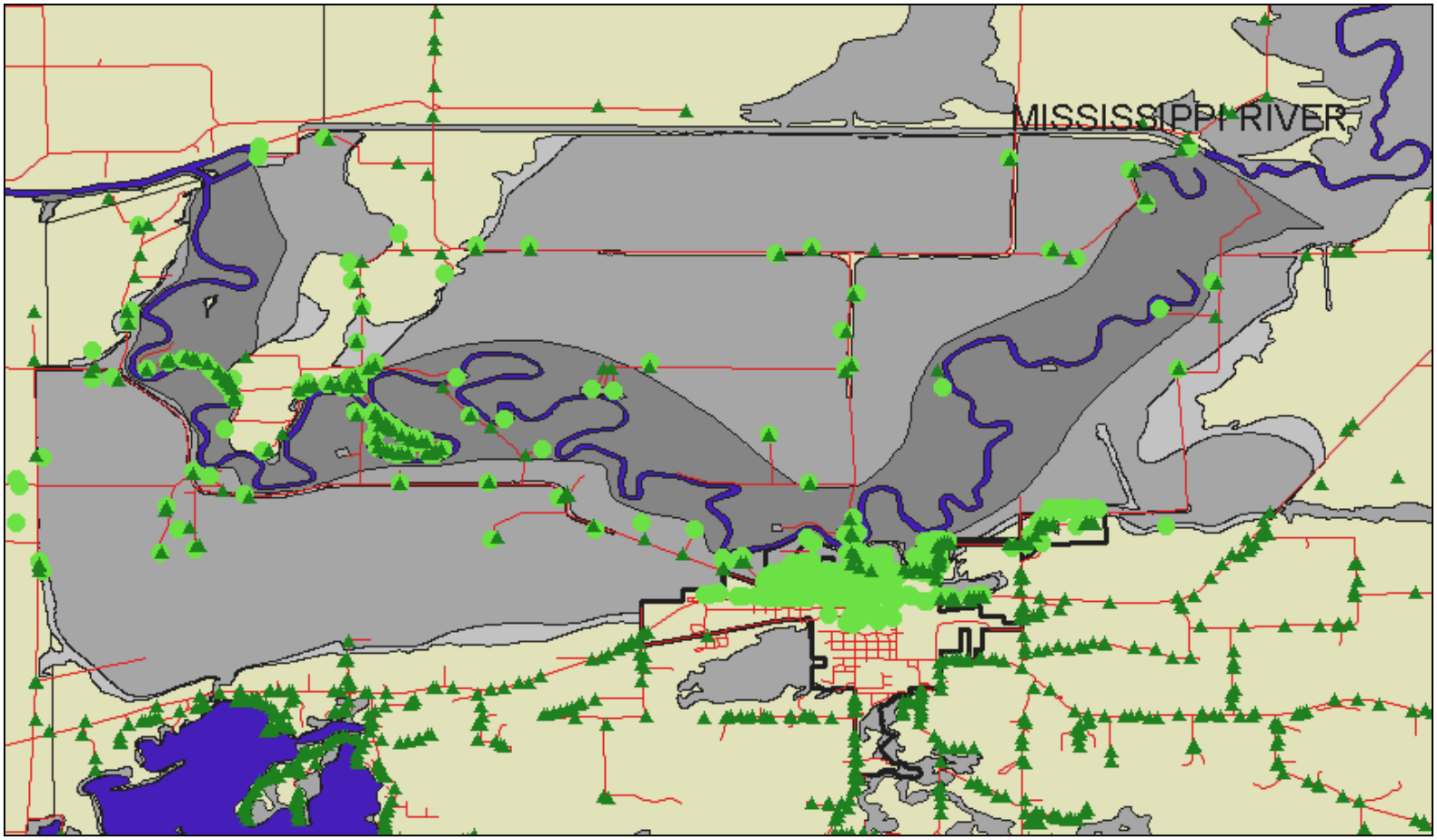


Shape	Point
STRUCTURE_AUTO	578
STRUCTURE_TAG	3-09202001-23
STRUCTURE_ID	23
STREET_NO	21771
STREET_NAME	512TH
STREET_SUFFIX	LN
FIRST_FLOOR_ELEVATION	1224.050000
GROUND_ELEVATION	1220.520000
X	-93.314110
Y	46.753940
LAKE_NAME	SANDY
TYPE_STRUCTURE	SINGLE FAMILY
TYPE_FOUNDATION	CRAWL SPACE
USE_STRUCTURE	RESIDENTIAL
TYPE_UTILITIES	SEPTIC SYSTEM
HABITABLE_AREA	1000.000000
AGE	20.000000
QUALITY_CONSTRUCTION	AVERAGE
CONDITION	AVERAGE
STYLE	ONE-STORY
EXTERIOR_WALL	SIDING
ROOFING	COMPOSITION SHINGLE
ATTACHED_GARAGE	0
DETACHED_GARAGE	0
SHED	1
CARPORT	0
FIREPLACE	0
BOATHOUSE	0
COMMENTS	
UNITID	3
DATE	2001-09-20 00:00:00
ZIP_CODE	55760

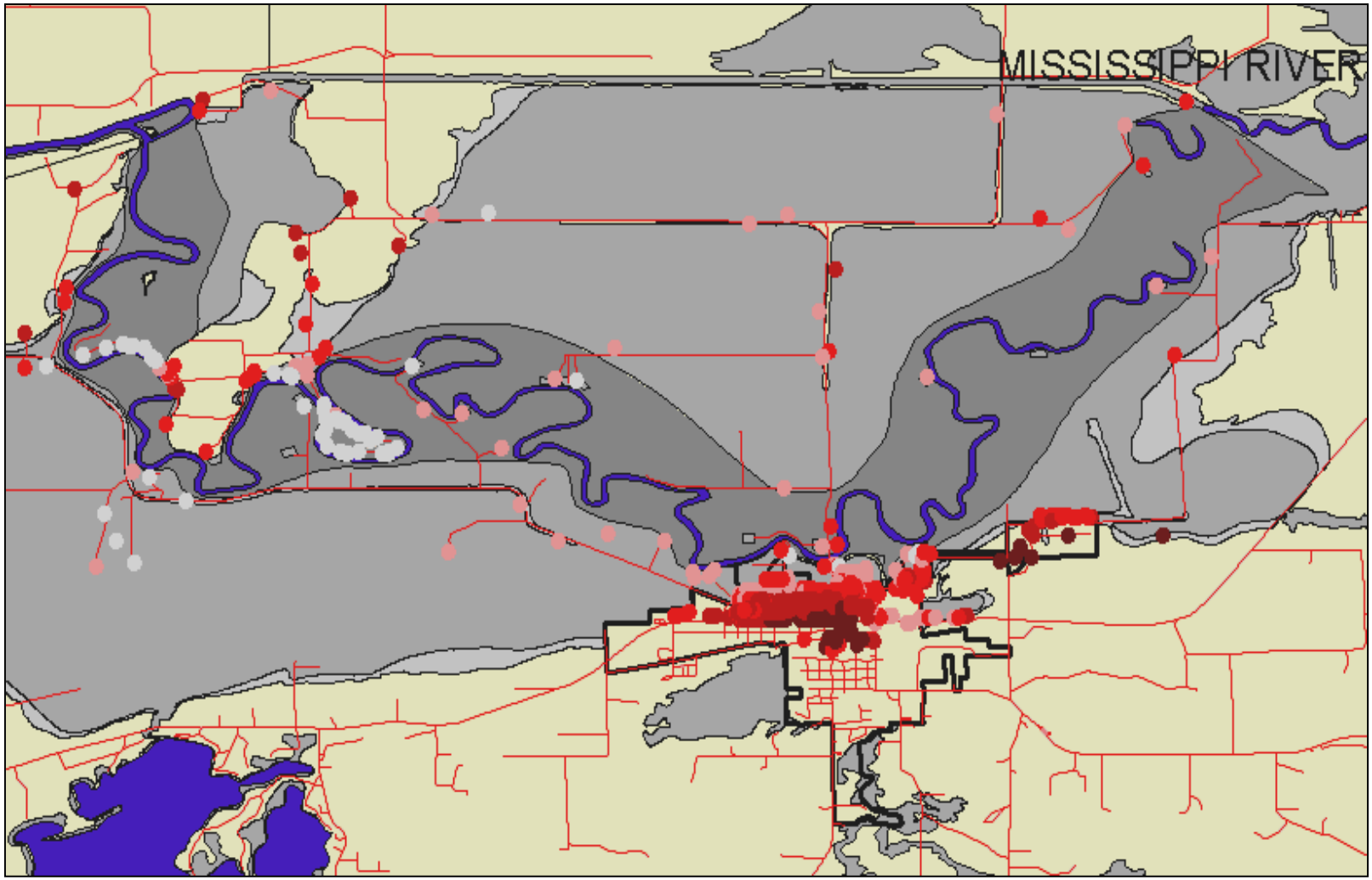
Aitkin address points and floodplain



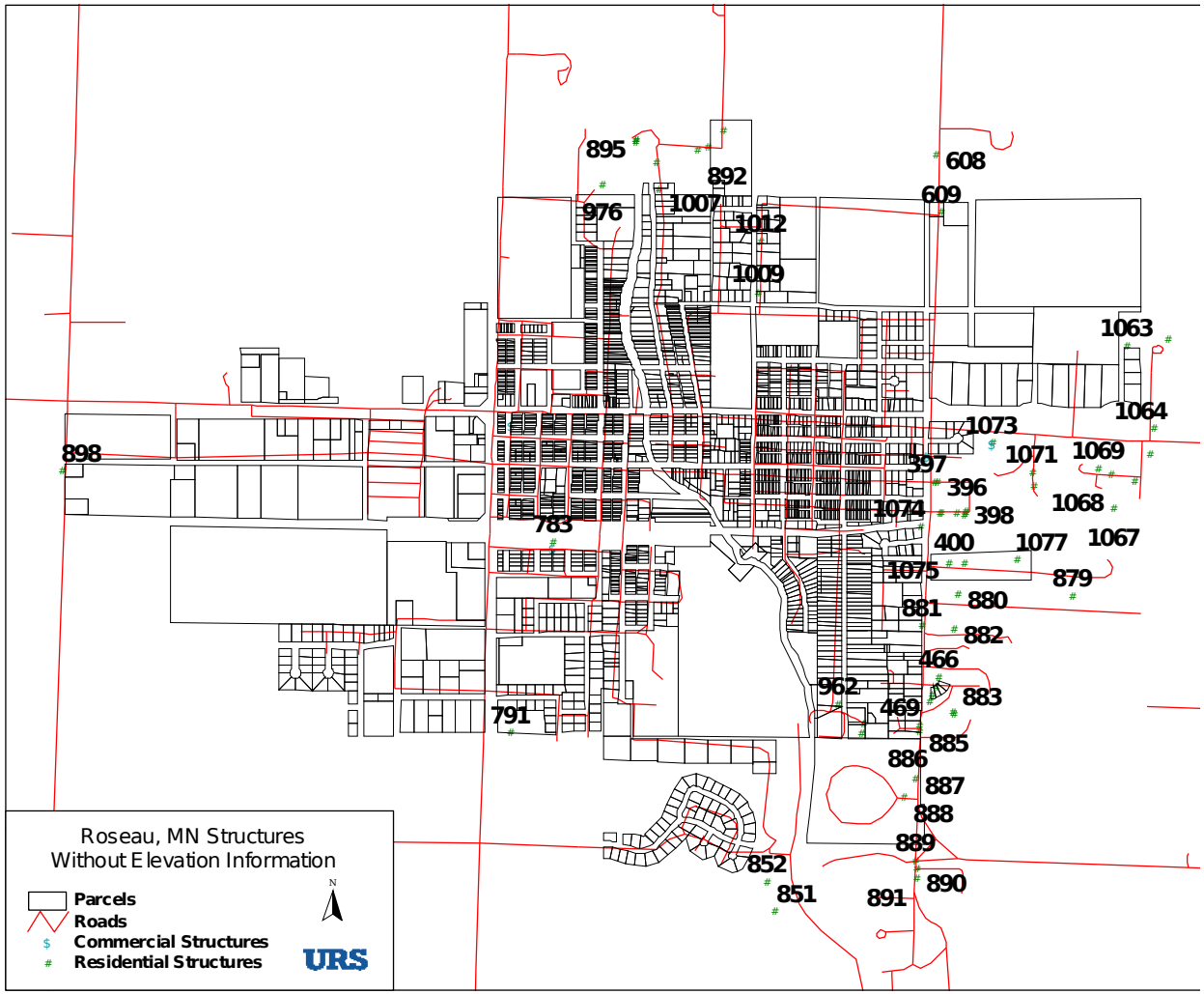
Address and GPS points for Aitkin



Color coded elevation data in Aitkin



Map of Structures with No First Floor Elevation



Database Possibilities

- **Identify structures inundated by high water**
- **Identify monetary damage to inundated structures**
- **Sort data into groups**
- **Display structures with specified criteria**

Roseau

- About 1,200 Structures in floodplain
- Very flat topography, most of the community experienced past flooding
- Needed to obtain detailed structure information to determine magnitude of flooding problems
- Spent two weeks with survey crews in the city to collect all the data for the floodplain
- Used a certified surveyor and three crews
  - Cost was about $40 to $45 per structure

Headwaters ROPE Study

- Collected data on about 1,400 structures in the predetermined “bounce”, or affect zone.
  - The total number of structures was around 5,000 in the chain of reservoirs (9 main and 62 sub lakes and river areas covered)
  - Remote setting required survey crews to travel by boat to access structures
- QA/QC visits were built into the contract and crews were spot checked to ensure consistency/quality
- Used a certified surveyor and three to four crews
  - Cost was about $70 to $75 per structure
    - Production rate is less due to the remote area and the distance between structures and reservoirs